Maximising the value of digital engineering for Australia

Global case studies and policy recommendations for further advancing the use of digital engineering in Australia's public sector

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Introduction

Digital engineering (DE) is the practice of using digital technologies, processes, and data to design, deliver, and manage construction assets across their entire lifecycle—from concept to construction, operations, and maintenance. Instead of relying on disconnected drawings and documents, DE creates an integrated digital thread that links together models, information, and insights. DE is often referred to as **building information modelling (BIM)** and in this paper, both terms are used interchangeably.

Around the world, DE has emerged as a key concept for improving project delivery, overcoming low productivity, reducing cost overruns, and enhancing collaboration in construction. Several countries have instituted BIM mandates or standards to reap these benefits. For instance, the United Kingdom (UK) has required BIM use on central government projects since 2016,[1] and Singapore phased in mandatory, BIM-based building plan submissions that started in 2013.[2] These mandates and standards have led to documented savings and quality improvements. Australia's public sector has also recognised the benefits of DE, in terms of efficiencies and productivity gains, enhanced collaboration, greater data integrity and quality, and increased sustainability.[3]

The public sector in Australia is continuing to progress in its journey to adopt DE. This white paper examines DE implementation in the public sector around the globe and outlines how Australia's public sector can continue to advance the use of DE—through mandates in public projects, capacity building, and other enabling policies—to streamline its infrastructure delivery. In doing so, Australia's public sector can not only improve project outcomes, but also address concerns related to the shortage of skilled professionals and low productivity in the construction industry.

Global BIM adoption: lessons from other countries

Many countries have developed national BIM programs or mandates, especially for projects in the public sector, seeing BIM as a catalyst for construction productivity and transparency. Table 1 provides an overview of BIM policy status in selected countries. These examples illustrate a global trend: governments are increasingly requiring or encouraging the adoption of BIM to ensure better project outcomes and to future-proof their construction industries.

Country	BIM policy	Scope of implementation
UK	**Mandate (2016):** Requires Level 2 BIM[4] for all centrally funded government construction projects	Central government projects (new builds and major renovations)
Singapore	**Mandate (2013–2015):** Phased introduction of BIM e-submissions for building plan approvals and BIM models required for new projects >5,000 m^2 with Gross Floor Area[5]	All building architecture and engineering submissions for regulatory approval
United States (US)	**Guidelines:** No nationwide BIM mandate (due to decentralised procurement). Major federal agencies (e.g. General Services Administration, US Army Corps) and many state governments have their own BIM requirements and standards.[6]	Agency-specific and federal or state-level public projects (e.g. federal buildings, transportation projects in certain states)
Australia	**Guidelines:** No nationwide BIM mandate. Queensland requires BIM for all public construction projects with a value of at least AU$50 million.[7] In other states, BIM has been adopted on a department-by-department basis, e.g. Victorian Transport Digital Engineering, and New South Wales' Infrastructure Digitalisation and Data Policy mandate a common data environment (CDE). The Australian BIM Advisory Board (ABAB) promotes best practices and consistent approaches between government and industry to BIM requirements and standards.	Selected departments and public projects (e.g. certain highway, rail, and building projects)

Table 1: BIM policy status in selected countries

United Kingdom

As a BIM pioneer in government, the UK government **"set out its requirement for fully collaborative 3D BIM on centrally procured government construction projects by 2016"** under its 2011-2015 Construction Strategy. This vision led to a formal mandate that all central government departments adopt Level 2 BIM (a defined standard of BIM collaboration) on public projects. The mandate, which took effect in April 2016, was backed by comprehensive standards (SO 19650) and guidance for the UK construction industry.

The UK government's goal was not only to reduce cost, but also to drive modernisation of the country's construction sector. According to the Cabinet Office, using BIM in government infrastructure procurement has yielded benefits, such as **20% lower building costs** and **33% savings over an asset's life cycle,**[8] while improving project quality. The UK experience demonstrates that strong government direction can rapidly increase BIM adoption across the construction industry.

BIM in government projects delivers results:

20%
reductions in building costs

33%
savings across the asset lifecycle

Today, the UK is progressing toward Level 3 BIM (integrated, life cycle BIM), which is also known as **"Digital Built Britain"**, to create an environment where technoloagy and working with technology is second nature in construction.[9] Notably, the UK's BIM program also aims to position British firms as world-leading BIM service exporters—an ambition that Australia can emulate.

Singapore

Singapore recognised early the productivity benefits of using BIM in its building industry. The country's Building and Construction Authority (BCA) launched a **BIM Roadmap** in 2010 and has gradually made BIM submissions a requirement for regulatory approvals. **Mandatory BIM e-submission for architectural and engineering plans has been introduced in phases since 2013,** And by 2015, BIM file submissions became compulsory for new building projects above a gross floor area >5000 m^2.[10]

BCA's BIM Roadmap required developers and design consultants to produce code-compliant BIM models for architecture, structure, and MEP (mechanical, electrical, plumbing) to obtain building permits. To facilitate this process, BCA provided standardised BIM templates and funded incentives for local firms to build capability. BCA's phased-in approach resulted in a high BIM uptake among architects and engineers, ensuring better-coordinated designs, automated rule-checking for building codes, and fewer errors during construction.

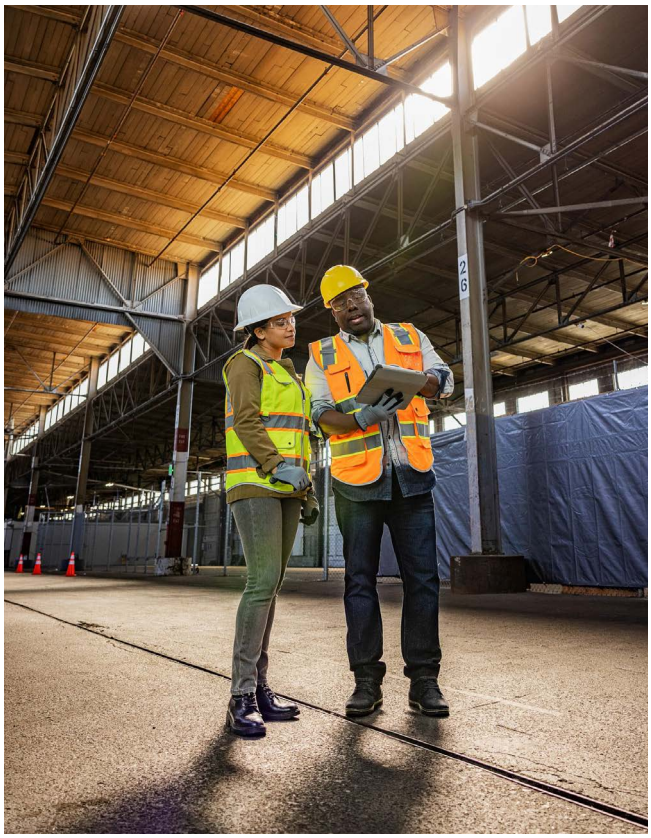
Moreover, Singapore's push for integrating BIM with other government-led initiatives, such as geospatial underground space planning, has demonstrated the value of using BIM data for broader urban planning. Singapore's success underscores the impact of having a clear mandate combined with incentives: by mandating BIM in the approval process, the government created an industry-wide impetus to adopt BIM, while also helping firms adapt by providing templates and financial support.

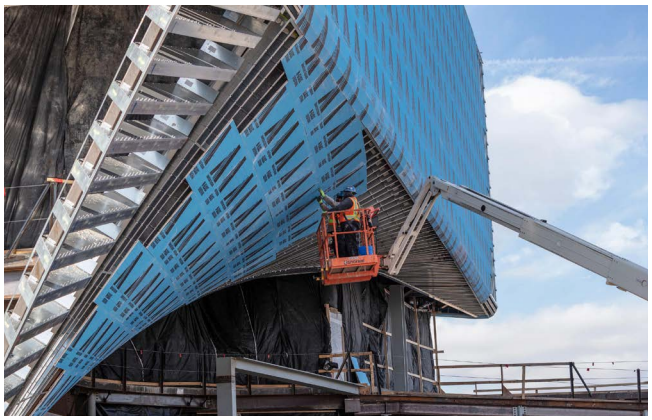
United States

In the US, BIM adoption has largely been driven by individual public agencies rather than through top-down federal and/or state mandates. The **National BIM Standard-United States (NBIMS-US)** was published in 2007 to provide voluntary guidelines, but **there is no national or state mandate or policy requiring BIM on all government projects.** This approach is partly because government procurement is decentralised; no single federal or state entity can impose such requirements across all jurisdictions.

Instead, various federal and state entities have set their own BIM guidelines. For example, the **General Services Administration (GSA)**, which oversees federal public buildings, requires BIM models for the design of major projects, initiating its BIM program in the mid-2000s. The **US Army Corps of Engineers (USACE)** mandates BIM and related standards for military construction projects. At the state level, Wisconsin has required BIM for large public projects since 2010, and other states' departments of transportation and education have BIM mandates for certain projects.

As a result, the US has pockets of very advanced BIM usage. But without a unified government directive, BIM implementation has been uneven. One challenge in the US is the lack of consistent standards used across projects, which can lead to project teams defining BIM deliverables differently. Even so, the US experience shows that strong public sector owner requirements—even if agency-specific—can drive BIM adoption.





Across these examples, a common pattern emerges: governments start by mandating BIM on large, high-value projects (or require BIM as part of tender qualifications), and over time extend those requirements more broadly as the local construction industry matures. Many governments also emphasise the use of **open BIM standards**—for example, requiring deliverables in industry foundation class (IFC)-standard, ISO 16739-compliant formats—to avoid vendor lock-in and achieve interoperability between different software.

Digital engineering in Australia: current adoption

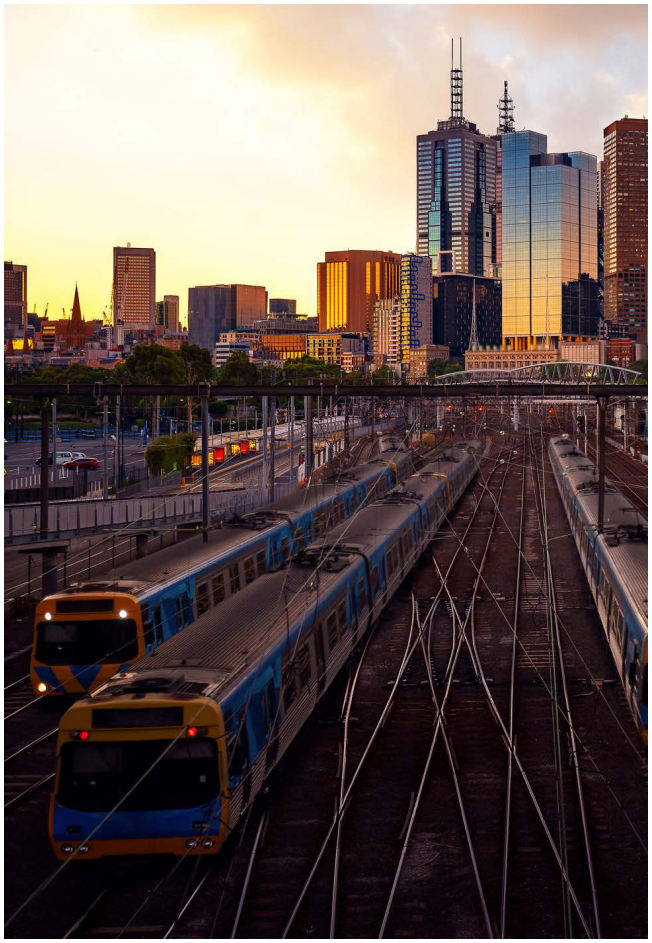
Australia's adoption of DE has been steadily gaining ground, particularly within world-class Tier 1 contractors, particular states, and within department-specific infrastructure programs. The 2021 report by the Australian Institute of Architects (AIA) found that 77% of respondents said using BIM enables better collaboration on construction documents, minimises extra work and delays, and helps streamline the construction process and cut waste, leading to a 51% increase in profitability. In addition, 60% of respondents found that using BIM speeds up projects due to better design quality.[11] These gains are especially relevant in Australia's context, where labour costs and productivity are key concerns for the public sector and for the construction industry.

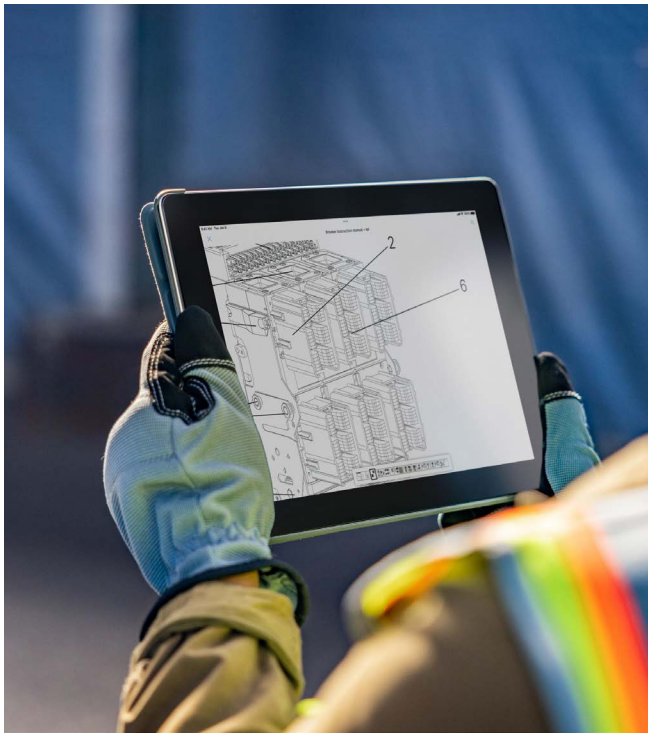
A critical area where DE improves productivity is through a common data environment, a centralised digital repository where project participants store and manage project information. A CDE ensures that all stakeholders have access to unified, up-to-date data, including documents and BIM models, thereby promoting collaboration, enhancing communication, and reducing errors by maintaining version control and providing an audit trail of all activities.

Early successes in DE adoption in Australia's public sector

Several government departments have already deployed DE. In 2018, the **Victorian Government** introduced the **Victorian Digital Asset Strategy (VDAS)** which mandated the integration of DE into major infrastructure projects to enhance productivity and collaboration and improve the flow of data across planning, construction, and maintenance through a CDE.[12]

Under its "Big Build" infrastructure program, the **Victorian Transport Digital Engineering (VTDE)** initiative is driving BIM model-based workflows, the creation of intelligent 3D BIM models, and improved data exchange across agencies, such as the Victorian Infrastructure **Delivery Authority (VIDA)** and the **Department of Transport and Planning (DTP)**, through a CDE.[13]





Transport for NSW (TfNSW) introduced a Digital Engineering Framework in 2018 and issued various technical guidance documents between 2022 and 2025 to support its implementation, including guides on BIM setup, BIM visualisation, and integrating contractors to its CDE.[14] The Framework promotes a holistic DE approach, treating BIM as one component of better managing asset data, costs, and risk. The Framework has been piloted in several projects, such as **Central Station Precinct, Transport Access Program (TAP) Stage 3, Parramatta Light Rail Stages 1 & 2,** and **Circular Quay Precinct Renewal**.[15]

More recently, **Infrastructure NSW** launched the **NSW Infrastructure Digitalisation and Data Policy**, which sets out how the NSW Government should embrace more efficient, innovative, and digital ways to deliver and manage the State's public infrastructure assets. The policy allows for an initial 18-month transition period to complete various actions, including establishing and maintaining a CDE and reflecting agency information requirements and data standards in procurement processes and contracts.

Early policy signals for further DE adoption in Australia's public sector

In November 2016, the Council of Australian Governments' (COAG) Transport Infrastructure Council endorsed National Digital Engineering Policy Principles as a step towards national adoption of DE in building and infrastructure development. The main objectives of the Policy included:

- promoting the greater uptake of DE by the building and infrastructure sectors nationally;
- encouraging greater innovation and efficiency in the delivery and management of public infrastructure;
- promoting consistency and openness in the data requirements for public infrastructure assets; and
- increasing public and private sector capability to optimise DE benefits.

In addition, the Policy Principles also recognised the importance of states and territories to operate within their own policy parameters. **Table 2** provides an overview of Australia's National Digital Engineering Principles.

1	A more consistent application of DE in public infrastructure will be actively encouraged and supported by governments at a level appropriate to the size and complexity of the asset.
2	DE data formats, standards, protocols, systems, and tools should be open and harmonised across governments, where possible, to facilitate greater consistency in engagement with industry.
3	DE data formats, standards, protocols, systems, and tools should be harmonised across whole of asset life cycle management processes, where possible, to ensure data that is built up through the design and construction phases of a project is fully utilised in the asset management and operations phases.
4	Governments will work to ensure DE approaches complement existing project design and development systems and interface with GIS to graphically display and visualise relevant information captured as part of the DE process.
5	Governments will work collaboratively across state and territory jurisdictions and with the private sector to drive best practice in the application of DE in public infrastructure development and management.
6	Governments will seek to actively incorporate lessons learned from all sectors and international experiences in the application of DE in public infrastructure development and management.
7	Governments will work to build capability within the public sector to support DE and, where practicable, enable an increase in private sector capability and capacity to optimise the application of DE.

Table 2: National Digital Engineering Policy Principles

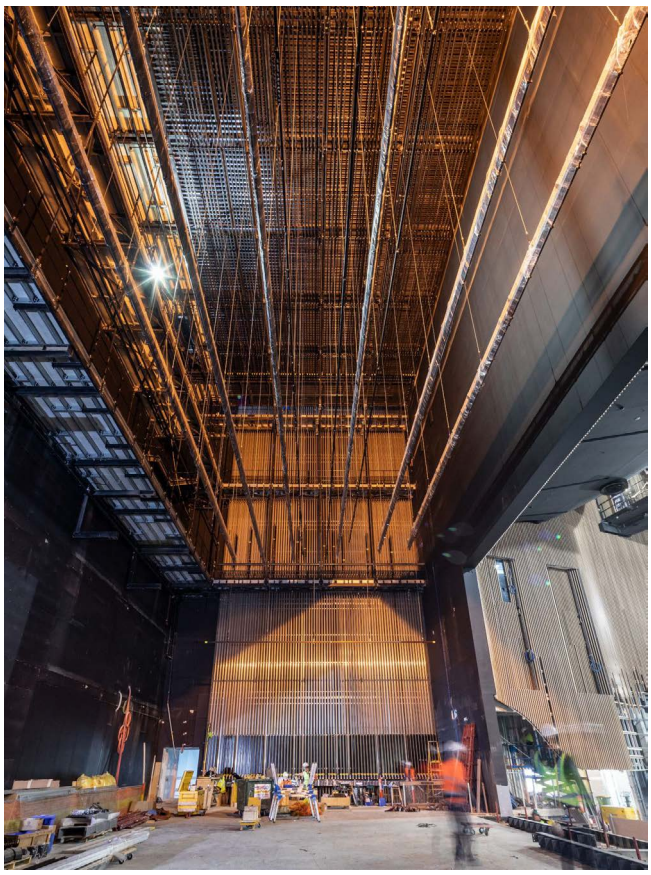
In February 2019, the ABAB, which was established in 2017 to take a whole of construction industry approach to the national adoption of BIM, published the Australian BIM Strategic Framework (ABSF)—an additional step for establishing a basis for state and federal governments to adopt a consistent national approach to BIM in building and infrastructure construction projects across Australia.[16] The ABSF articulates four strategic action areas for which the Australian industry aims to work collaboratively with state and territory governments to achieve this objective. **Table 3** provides an overview of the ABSF's four strategic action areas.

1	**Providing clear direction about government BIM adoption and requirements**	State and territory governments will develop policies and guidance appropriate to their jurisdictions, through a joint government and industry approach, consistent with the Framework.
2	**Developing and adopting standards and ensuring an open and common data environment**	BIM data formats, standards, protocols, systems, and tools should be open and harmonised across the nation, where possible, to ensure that the benefits of BIM can be fully realised by industry and governments.
3	**Enhancing procurement and contractual arrangements**	State and territory governments recognise that transparency in procurement and contracting is essential for building capability and enabling industry engagement and development.
4	**Encouraging the development of skills and building capabilities**	State and territory governments recognise the importance of developing skills and capabilities to enable BIM to be utilised across the entire asset life cycle.

Table 3: Australian BIM Strategic Framework 4 strategic action areas

In addition, NATSPEC,[17] a not-for-profit organisation that is focused on improving the construction quality and productivity of the built environment through leadership in the provision of specification information, developed a National BIM Guide for Australia in 2011 to clarify BIM requirements for stakeholders in a nationally-consistent manner, at the request of the Commonwealth Department of Innovation. The National BIM Guide details BIM deliverables, including documentation and data standards in support of the BIM process.

The Australasian Procurement and Construction Council (APCC), which consists of Australian and New Zealand government agencies with responsibility for the disciplines of procurement, construction, and asset management policy and practice, has encouraged the implementation of BIM in the development of public infrastructure projects by publishing a central repository of knowledge and expertise to support improved delivery of services, including *A Framework for the Adoption of Project Team Integration and Building Information Modelling*.



In parallel, some initial state policies have emerged. As mentioned in Table 1, Queensland required BIM from the early planning phase for all government construction projects with a value of at least AU$50 million in July 2019. However, BIM has been adopted on a department-by-department basis in practice. For example, Queensland State Department of Health strongly recommends BIM for all government construction projects with a value of at least $10 million while Transport Main Roads has adopted BIM for all projects.

Finally, in 2017 Standards Australia published AS ISO 16739 for data sharing in the construction industry. Australia's standard is identical to the international standard ISO 16739. Having a standard data schema and exchange file format for use of BIM ensures consistency when exporting IFC file formats and providing interoperability between software applications.

Current gaps and barriers to further DE adoption in Australia's public sector

Despite considerable progress, DE adoption in Australia's public sector remains fragmented—often project or department-specific. The major challenges are:

Piecemeal implementation of national standards and protocols: Without consistent state-level or department-level BIM requirements, adoption and interoperability suffer, leading to inconsistent digital asset delivery and limiting data reuse across projects.

Change management resistance: The government and the construction industry are accustomed to 2D drawings and paper-based site coordination. Shifting to digital-first, collaborative workflows requires behavioural change, senior leadership support, and incentives.

Cost and access barriers: DE software, hardware, and training are capital-intensive. Government and small and medium-sized contractors may struggle with upfront costs. There is also uncertainty about choosing between proprietary platforms, leading to concerns with interoperability and vendor lock-in.

Technology and data integration challenges: Full use of DE involves the ability to manage large datasets across a construction supply chain and may require integration with geographic information system (GIS) and enterprise resource planning (ERP) tools, requiring behavioural change and know how.

Untapped long-term value of BIM data: BIM data is rarely handed over to the asset owner in a structured, usable format for operations and maintenance, resulting in receipt of incomplete, inconsistent, or overly complex BIM models that are not aligned with facility management systems or operational workflows. This approach breaks the "digital thread"—the continuity of structured information from design to operations—and limits the long-term value of digital project data. Consequently, BIM data is viewed as a project cost rather than as a long-term asset, requiring a shift in mindset and practice to treating BIM data as a durable, operational resource, not just a design deliverable.

The role of Australia's private sector in advancing DE exports

Australian engineering services and construction firms—especially those with global footprint—have significantly advanced DE practices in Australia. Aurecon,[18] GHD,[19] and Hansen Yuncken[20] have developed DE capabilities internally and often act as early adopters and evangelists locally. Global engineering firms like AECOM, Atkins, and Jacobs, which are active in Australia, bring mature DE workflows to their projects, raising industry benchmarks and capabilities.

As Australia's public sector further advances DE adoption, this skilled workforce can become an **export opportunity**—servicing infrastructure and construction projects across the Asia-Pacific region. Just as Australia has become a global leader in digital government,[21] it can also become a centre for digital construction innovation if DE talent pipelines are scaled systematically.

Policy recommendations for Australia's public sector to advance greater DE adoption

To fully harness the benefits of DE, Australia's public sector should pursue a multi-pronged strategy supported by policy measures and funding. Below are key recommendations:

1.

Establish state-level DE mandate and roadmaps

Clear state-level policies on DE are essential for signalling commitment and guiding government and industry. If not executed already, state governments should mandate phased adoption of BIM for public infrastructure projects, similar to the UK model. For example, Phase 1 could require BIM on all government projects above a certain value (for example $50 million, as in Queensland). Phase 2 could expand BIM to all public projects by a target year (e.g. by 2028), including local council projects, possibly with minimum thresholds decreasing over time.

A multi-year roadmap should be published, detailing timelines and increasing levels of BIM maturity expected. Crucially, mandates and roadmaps should be accompanied by guidance. The UK's experience shows that even a "soft" mandate (without strict penalties) can drive change if supported by government leadership. Therefore, a policy directive from the highest levels of state government (e.g. a Cabinet decision or a Premier's directive to all departments) should announce BIM as the default approach for large-scale infrastructure development, barring exceptional cases.

2.

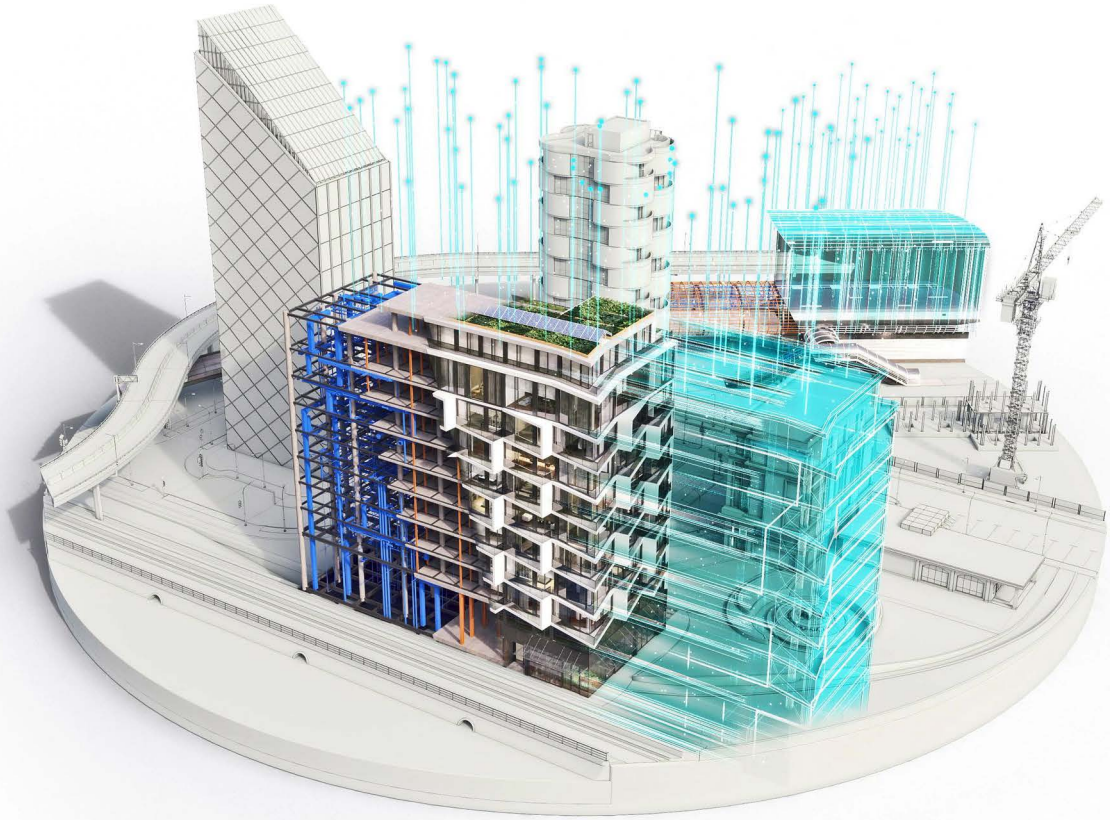
Link state-level BIM mandates and roadmaps to Australia's existing national BIM standards and guidelines

Australia already has an existing, nationally recognised standard that provides guidance on BIM execution plans, data formats, and collaboration protocols (2022 NATSPEC National BIM Guide).[22] State-level BIM mandates and roadmaps should promote this standard across all government agencies and the industry. Open data standards for BIM, specifically AS ISO 16739, should be encouraged in this process to ensure interoperability between different software platforms.

3.

Champion and spotlight DE through flagship state government infrastructure programs

Whether the state government has a BIM mandate and roadmap or not, it should leverage its flagship infrastructure programs to drive greater BIM and DE adoption. To this end, all **major new publicly-funded infrastructure projects** should include DE requirements in their project contracts. For example, permanent infrastructure that will be developed for the Brisbane 2032 Olympics and Paralympics Games and related transportation projects should explicitly require DE. Similarly, marquee projects such as the Bruce Highway Upgrade Program[23] and the Princes Highway upgrade[24] should adopt DE in the planning and design stages to set an example to make DE the "new normal" for state government projects.



4.

State government asset owners should take the lead in CDE ownership and managing asset data

By leading CDE ownership, public sector asset owners can ensure that data management processes are standardised, secure, and consistent across all stakeholders, which promotes better collaboration and reduces project risks. Centralised data management also helps maintain a single source of truth, eliminate confusion, and ensure that all project participants have access to up-to-date information, ultimately leading to more successful project outcomes. Government asset owners should also be willing to invest in rich data that delivers beyond the minimum specifications of a project and include this requirement in contracts.

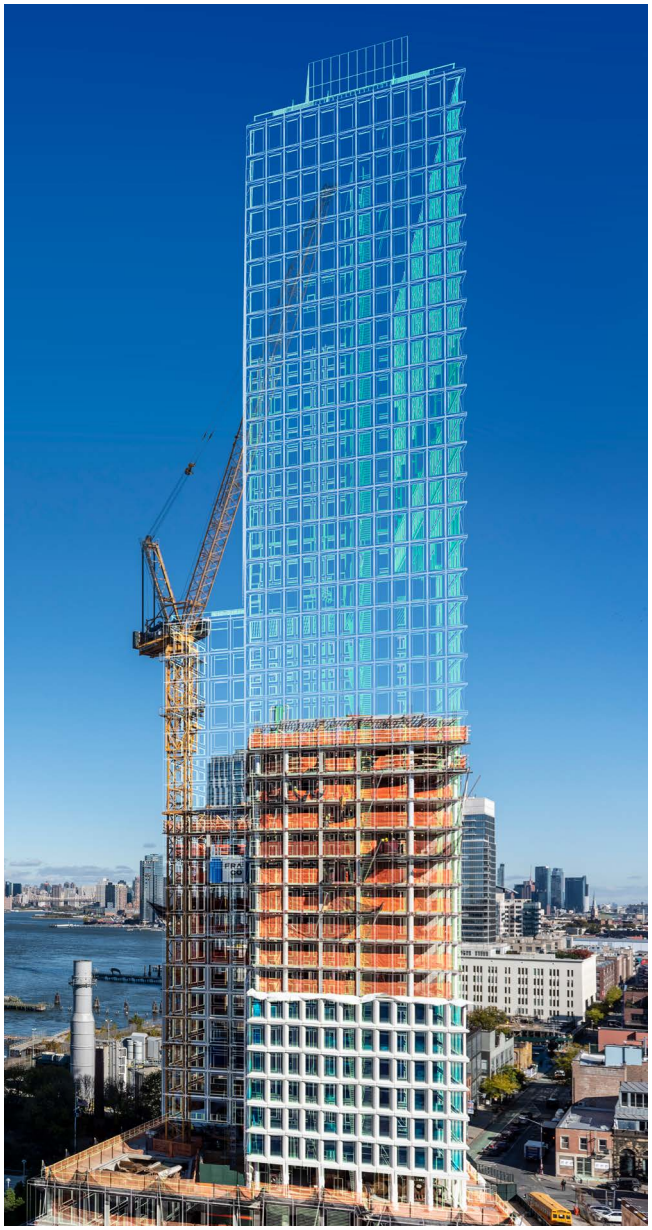
Australia's largest public transport project—Sydney Metro, and Western Australia's biggest road initiative—NorthLink WA, demonstrate how government asset owners are putting CDEs in place to ensure collaborative asset data management and to leverage it for ongoing operational use.

5.

Encourage greater consistency of DE adoption across and within state government departments

State government departments are already institutionalising DE knowledge, but greater consistency and collaboration within and across state departments, using frameworks such as the ABAB, should be encouraged. For example, existing recommendations for public sector state and federal procurers to collectively adopt a common set of BIM standards, protocols, and procurement guidelines should be followed to reduce fragmented requirements across states and agencies.[25]

In addition, state government departments should also ensure consistency in contractual arrangements across and within departments, specifying consistent delivery of project information models and asset information models to asset owner requirements.



6.

Invest in DE capacity building and training for Australia's public sector

A critical enabler for greater adoption of DE in Australia's public sector is human capital. To this end, state governments should fund **capacity building programs** to train public officials, engineers, and construction professionals in DE skills. For example, the Victorian Government has introduced accredited specialised BIM qualifications—including a Course in Building Information Modelling (22654VIC) and an Advanced Diploma of BIM (22655VIC)—that is delivered through registered training providers.[26]

In addition, **training programs through line departments and government-led training institutes** should be scaled up. For example, since 2020 the NSW Government's Institute for Applied Technology has partnered with industry and Technical and Further Education (TAFE) NSW to offer micro-credential programs on BIM to bridge the gap between academic theory and practical application for vocational learners, including public officials.[27]

State governments may provide dedicated budget for each department to upskill a target number of staff annually in DE. Capacity building could also extend to industry who work on government projects, possibly by making DE training a pre-bid qualification.

7.

Encourage vendor diversity and local innovation

It is important that DE adoption in Australia's public sector remains vendor-neutral to foster a competitive software ecosystem. State governments should avoid reliance on any single software provider and contracts should stipulate deliverables in interoperable formats (e.g. IFC) so that no one vendor dominates.

Conclusion

Digital engineering provides an opportunity to transform Australia's construction sector—a continued shift from fragmented, 2D, and paper-based workflows to collaborative, data-rich, and digital ones. Countries that have embraced this transformation are already seeing significant returns in terms of project efficiency, productivity, and quality. Australia stands to gain immensely from further implantation of DE, given its infrastructure ambitions and industry constraints.

By implementing the recommendations outlined, Australia's public sector can further accelerate its DE journey. The payoff will be multi-fold: infrastructure that is constructed more productively, reduced delays and overruns, enhanced transparency, and continued development of a digital construction workforce. With committed policy support, DE can help Australia deliver on its 10-year long, $120 billion infrastructure investment pipeline[28] more effectively and sustainably, while also positioning the country as a global leader in digital construction innovation.

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